

Science Bowl Questions 1994

Round 3

Toss-Up

1. MATH; Multiple Choice: An automobile is traveling at 60 miles per hour. What velocity is that in feet per second?
 - a) 20 ft/sec
 - b) 30 ft/sec
 - c) 88 ft/sec
 - d) 96 ft/sec

ANSWER: C – 88 FT/SEC

Bonus

1. MATH; Short Answer: What is the next number in the series: 0, 2, 24, ...?

ANSWER: 252 – THE SERIES REPRESENTS (N TO THE NTH POWER) MINUS N

Toss-Up

2. PHYS; Multiple Choice: Which of the following is a compound lens for directing light through the objective of a compound microscope?
 - a) Leyden condenser
 - b) Abbe condenser
 - c) optical condenser
 - d) reflux condenser

ANSWER: B – ABBE CONDENSER

Bonus

2. PHYS; Multiple Choice: A spring vibrates in simple harmonic motion according to the equation $X = 15\cos(\pi t)$ where x is in centimeters and t is in seconds. What is the total number of cycles this body makes in 10 seconds?
 - a) 0.5
 - b) 5
 - c) 10
 - d) 15

ANSWER: B – 5

Toss-Up

3. BIOL; Multiple Choice: The group which most likely gave rise to the land vertebrates is the:
- a) ray-finned fish
 - b) lobe-finned fish
 - c) jawless fish
 - d) placoderms

ANSWER: B – LOBE FINNED FISH

Bonus

3. BIOL; Multiple Choice: During which of the following geologic eras did most modern mammals, birds, and flowering plants evolved?
- a) Archaean
 - b) Paleozoic
 - c) Mesozoic
 - d) Cenozoic

ANSWER: D - CENOZOIC

Toss-Up

4. CHEM; Multiple Choice: Which of following hydrocarbons would have the highest boiling point?
- a) 3,3-dimethylpentane
 - b) decane
 - c) n-heptane
 - d) 2-methylheptane

ANSWER: B – DECANE

Bonus

4. CHEM; Short Answer: The boiling point of a homologous series of alkanes or branched alkanes increases with increases with increasing carbon number. The boiling point is lower if the molecules are branched. What is the primary intermolecular force holding these molecules together?

ANSWER: VAN DER WAALS ATTRACTION

Toss-Up

5. COMP; Short Answer: What control structure is generally used in BASIC for count-controlled loops?

ANSWER: FOR/NEXT -OR- THE FOR LOOP -OR- THE FOR/NEXT LOOP

Bonus

5. COMP; Short Answer: Consider a decoder, encoder multiplexer, and demultiplexer. Which two can be realized by the same logic circuit?

ANSWER: DECODER AND DEMULTIPLEXER

Toss-Up

6. BIOL; Multiple Choice: Most scientists do not consider viruses to be “alive” because:
- a) they have no genetic material
 - b) they lack metabolic machinery to grow and reproduce on their own
 - c) they have no cell membrane
 - d) no definite structural features can be seen with a microscope

ANSWER: B – THEY LACK THE METABOLIC MACHINERY TO GROW AND REPRODUCE ON THEIR OWN

Bonus

6. BIOL; Multiple Choice: “Blue-green algae” are classified:
- a) as bacteria because they lack a nuclear membrane and other membrane-bound organelles
 - b) as bacteria because they are heterotrophies
 - c) as green plants because they carry on photosynthesis
 - d) as green plants because their cell wall is made of cellulose

ANSWER: A – AS BACTERIA BECAUSE THEY LACK A NUCLEAR MEMBRANE AND OTHER MEMBRANE-BOUND ORGANELLES

Toss-Up

7. PHYS; Multiple Choice: A worker pushes a heavy (100 kg) crate that is resting on a thick carpet. The coefficients of static and kinetic friction are 0.6 and 0.4 respectively. The worker pushes with a force of 500 Newtons. The frictional force exerted by the surface is:
- a) 1000 N
 - b) 600 N
 - c) 500 N
 - d) 400 N

ANSWER: C – 500 N

Bonus

7. PHYS; Multiple Choice: In optics, the failure of a surface to satisfy the Abbe sine condition is a measure of:
- a) coma
 - b) surface roughness
 - c) chromatic aberration
 - d) spherical aberration

ANSWER: A - COMA

Toss-Up

8. CHEM; Multiple Choice: Which of the following statements is NOT true about butyl alcohol and dimethyl ether?
- a) both compounds have a net dipole moment
 - b) both compounds can form intermolecular hydrogen bonds between two molecules of the substance
 - c) they are structural isomers of one another
 - d) butyl alcohol has a higher boiling point than dimethyl ether

ANSWER: B – BOTH COMPOUNDS CAN FORM INTERMOLECULAR HYDROGEN BONDS BETWEEN TWO MOLECULES OF THE SUBSTANCE

Bonus

8. CHEM; Short Answer: What two elements are the main constituents of solder?

ANSWER: LEAD AND TIN

Toss-Up

9. ASTR; Short Answer: Name the U.S. spacecraft that, prior to reaching its designed goal of photographing Mars, was lost in space in 1993.

ANSWER: MARS OBSERVER

Bonus

9. ASTR; Multiple Choice: What is the period of rotation of the Sun about its own axis?
- a) 27.3 days
 - b) Zero, the sun does not rotate
 - c) 24 hrs
 - d) varies w/ solar latitude

ANSWER: D – VARIES WITH SOLAR LATITUDE (25 DAYS AT THE EQUATOR AND 36 DAYS AT THE POLES)

10. OMMITTED

Toss-Up

11. CHEM; Multiple Choice: Which of the following molecules would have a net zero dipole moment?

- a) dichloromethane
- b) trichloromethane
- c) tetrafluoromethane
- d) chloromethane

ANSWER: C - TETRAFLUOROMETHANE

Bonus

11. CHEM; Multiple Choice: Which of the following molecules would have the largest dipole moment?

- a) chloromethane
- b) dichloromethane
- c) trichloromethane
- d) fluoromethane

ANSWER: D - FLUOROMETHANE

Toss-Up

12. BIOL; Multiple Choice: Which of the following statements about bacteria is true?

- a) They are diploid organisms
- b) They produce gametes
- c) Their DNA molecules are circular
- d) They are eukaryotic

ANSWER: C – THEIR DNA MOLECULES ARE CIRCULAR

Bonus

12. BIOL; Multiple Choice: Most bacteria:

- a) are photosynthetic, obtaining their energy from sunlight
- b) are chemosynthetic, obtaining their energy from inorganic chemicals
- c) are thermosynthetic, obtaining their energy from heat
- d) are heterotrophic, obtaining their energy from decomposing organic matter

ANSWER: D – ARE HETEROTROPHIC, OBTAINING THEIR ENERGY FROM DECOMPOSING ORGANIC MATTER

Toss-Up

13. ERSC; Multiple Choice: Which of the following is the hardest mineral?

- a) quartz
- b) pyrite
- c) corundum
- d) calcite

ANSWER: C - CORUNDUM

Bonus

13. ERSC; Short Answer: The mineral corundum occurs as several gemstones. Name one.

ANSWER: SAPPHIRE OR RUBY

Toss-Up

14. CHEM; Multiple Choice: Which peak pattern would the proton on carbon number one exhibit in the proton magnetic spectrum of 1,1,2 trichloroethane?

- a) singlet
- b) doublet
- c) triplet
- d) quartet

ANSWER: C - TRIPLET

Bonus

14. CHEM; Multiple Choice: The room temperature proton nuclear magnetic resonance (nmr) spectrum of cyclohexane has a single broad peak. In the low temperature spectrum of cyclohexane two peaks separate out of the broad peak. These peaks result from:

- a) coupling between molecules of cyclohexane
- b) the signals from the axial and equatorial hydrogens
- c) spin-spin splitting of the hydrogens
- d) carbon hydrogen coupling

ANSWER: B – THE SIGNALS FROM THE AXIAL AND EQUATORIAL HYDROGENS

Toss-Up

15. PHYS; Multiple Choice: A body of weight W is in free fall near the surface of the earth. What force does the body exert on the earth?

- a) zero
- b) W
- c) less than W
- d) greater than W

ANSWER: B – W

Bonus

15. PHYS; Short Answer: Unstable nuclei seek stability via three different processes: alpha decay, beta decay and gamma decay. What is the principal difference between the beta emission spectra and the emission spectra of the other two decay modes?

ANSWER: BETA DECAY PRODUCES A CONTINUOUS ENERGY SPECTRUM WHILE BOTH ALPHA AND GAMMA DECAY PRODUCE DISCRETE SPECTRA

Toss-Up

16. BIOL; Multiple Choice: Which of the following is true of xylem?

- a) It conducts water downward in the plant
- b) It transports food upward in the plant
- c) It transports water and minerals through the plant
- d) It conducts oxygen and carbon dioxide through the plant

ANSWER: C – IT TRANSPORTS WATER AND MINERALS THROUGH THE PLANT

Bonus

16. BIOL; Multiple Choice: What causes population “blooms” of “red tides” and extensive fish kills?

- a) red algae
- b) dinoflagellates
- c) diatoms
- d) protozoans

ANSWER: B - DINOFLAGELLATES

Toss-Up

17. CHEM; Multiple Choice: Other factors being equal, the reaction that proceeds the fastest would have:

- a) the most negative standard free energy change
- b) the most negative standard enthalpy change
- c) the smallest standard entropy change
- d) lowest energy of activation

ANSWER: D – LOWEST ENERGY OF ACTIVATION

Bonus

17. CHEM; Short Answer: The dehydration of saturated alcohols in hot aqueous acid solutions can be used to produce alkenes. Give the IUPAC names for the two alkenes that could form from the dehydration of 2-methyl-2-butanol.

ANSWER: 2-METHYL-2-BUTENE AND 2-METHYL-1-BUTENE

Toss-Up

18. MATH; Short Answer: What is the hexadecimal sum of the hexadecimal numbers 0f and 0c

ANSWER: 1B

Bonus

18. MATH; Multiple Choice: In a regular polygon, what is the perpendicular from one of its sides to its center called

- a) tangent
- b) frustum
- c) apothem
- d) gnomon

ANSWER: C - APOTHEM

Toss-Up

19. ASTR; Short Answer: What is the designated spectral type of the Sun?

ANSWER: TYPE-G OR TYPE G2

Bonus

19. ASTR; Multiple Choice: Craters and Maria (seas) cover the Moon. Compared to the near side of the Moon, the far side is:

- a) more cratered, with more extensive maria
- b) more cratered, with less extensive maria
- c) less cratered, with more extensive maria
- d) less cratered, with less extensive maria

ANSWER: B – MORE CRATERED, WITH LESS EXTENSIVE MARIA

Toss-Up

20. BIOL; Multiple Choice: Natural selection operates to produce changes in:

- a) individuals
- b) populations
- c) phyla
- d) environmental conditions

ANSWER: B - POPULATIONS

Bonus

20. BIOL; Multiple Choice: The plant group with the greatest number of living species is the:

- a) angiosperms
- b) gymnosperms
- c) bryophytes
- d) green algae

ANSWER: A - ANGIOSPERMS

Toss-Up

21. GENR; Multiple Choice: What is a device called that has blades which are turned by a force, (e.g., that of wind, water or high pressure steam)?

- a) Motor
- b) Reactor
- c) Generator
- d) Turbine

ANSWER: D - TURBINE

Bonus

21. GENR; Short Answer: What was the name and profession of the person who proposed the theory of Continental Drift (Plate Tectonics)?

ANSWER: (ALFRED) WEGENER (1880-1930) A (GERMAN) METEOROLOGIST

Toss-Up

22. ERSC; Multiple Choice: Which of the following locations in the U.S. has the greatest average annual rainfall?

- a) Olympic Peninsula
- b) Florida
- c) Louisiana
- d) Kauai (Hawaii)

ANSWER: D – KAUAU (HAWAII)

Bonus

22. ERSC; Short Answer: If the oceans were drained, what would be the tallest mountain in the world, measured from base to top?

ANSWER: MAUNA LOA

Toss-Up

23. PHYS; Multiple Choice: A shopper (in a large dept. store) steps on an escalator moving downward at a constant speed. On his way down, the normal force exerted on him by the step of the escalator is:
- a) greater than his weight when he is off the escalator
 - b) equal to his weight when he is off the escalator
 - c) less than the weight when he is off the escalator
 - d) dependent on how fast the escalator is moving

ANSWER: B – EQUAL TO HIS WEIGHT WHEN HE IS OFF THE ESCALATOR

Bonus

23. PHYS; Multiple Choice: The Hall effect shows that the charge carriers for metallic conductors are
- a) negative
 - b) positive
 - c) both negative and positive
 - d) not determinable

ANSWER: A – NEGATIVE

Toss-Up

24. COMP; Multiple choice: Which of the following types of computer systems is best suited to tasks which are repetitive and require little user intervention?
- a) EIS
 - b) MIS
 - c) DSS
 - d) EDP

ANSWER: D – EDP

Bonus

24. COMP; Multiple Choice: An EIS is a computer system designed for:
- a) The data entry clerks of the organization
 - b) The field-level management of the organization
 - c) The senior-most management of the organization
 - d) The information systems personnel of the organization

ANSWER: C – THE SENIOR-MOST MANAGEMENT OF THE ORGANIZATION

Toss-Up

25. GENR; Multiple choice: A type of fuel which results from the compression of the remains of living matter over millions of years is:

- a) radon
- b) natural gas
- c) gasohol
- d) geothermal

ANSWER: B – NATURAL GAS

Bonus

25. GENR; Multiple Choice: What is the principal gas produced when organic matter rots in the absence of oxygen?

ANSWER: METHANE
